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ABSTRACT

Factors were investigated under acquisition and retention conditions which might be expected to counteract interference brought on by mixing sight and phonics methods. Experiment 1 dealt with training kindergarten children to attend to and encode letter pattern cues and the word's contextual cues. Subjects were trained individually in a series of four tasks: developing attention to letter cues, sight learning of letter-contrasted words, sight learning of function and content words, and sight learning of the words in sentence context. Results of Experiment 1 indicated that the systematic letter pattern training did not improve sight word learning and that the sentence context may not be a very effective vehicle for learning sight words. In Experiment 2, kindergarten children practiced sight words and phonics-based words in either list or sentence formats prior to testing and practice on a retention-transfer task. The factors investigated in Experiment 2 were found to be largely ineffective in improving word identification during reading. Tables and references are included. (Author/AW)

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The Effects of Serial Pattern Discrimination and Mixed Word Identification Training on Sight Word Acquisition and Retention

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THE EFFECTS OF SERIAL PATTERN DISCRIMINATION AND MIXED WORD IDENTIFICATION TRAINING ON SIGHT WORD ACQUISITION AND RETENTION[1]

John Koehler, Jr.

ABSTRACT

Factors were investigated under acquisition and retention conditions which might be expected to counteract interference brought on by mixing sight and phonics methods. Experiment I dealt with training K-level children to attend to and encode letter pattern cues and the word's contextual cues. Experiment II had K-level children practice sight words and phonics-based words in either list or sentence formats prior to testing and practice on a retention-transfer task.

The results of Experiment I indicate that systematic letter pattern training did not improve sight word learning and that the sentence context may not be a very effective vehicle for learning sight words. The factors investigated in Experiment II were found to be largely ineffective in improving word identification during reading (the retention-transfer task).

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[1]This paper was presented at the American Educational Research Association meeting in New York on February 7, 1971.

THE EFFECTS OF SERIAL PATTERN DISCRIMINATION AND MIXED WORD IDENTIFICATION TRAINING ON SIGHT WORD ACQUISITION AND RETENTION[1]

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The experiments reported are concerned with controlling interference arising when words are identified as whole units and/or with the use of phonics principles. Because prose writing requires the use of words violating the more productive phonics principles, the beginning reader is required to learn some words by the whole word or sight method. A phonics word attack may conflict with whole word learning because the reader will be taught to make subword responses to words in the phonics instruction. Moreover, these competing effects should be prevalent in beginning reading since young children have been found to associate whole word pronunciations to single letters or to some other superficial feature of the word (Marchbanks & Levin, 1965).

To determine how to offset the interference of mixed word identification approaches, factors concerned with improving sight word (SW) learning and recall were investigated in two experiments. Experiment I was designed to investigate conditions which might improve attention to the letter sequence cues in words and the cues of a word's characteristic reading context. Experiment II treated factors that might be expected to improve SW recall in the reading context where both word identification approaches operate.

Experiment I

Design and Procedure. In Experiment I, each S was trained individually in a series of four tasks. In Task 1, the S was exposed to training procedures designed to develop attention to letter cues in short words. Task 2 tested for Task 1 effects by having all Ss sight learn words contrasting as pairs in letter order (was vs. saw) and at letter position (hid vs. had). Task 3 covered sight learning of function (determiners, prepositions, pronouns, and auxiliary verb forms) and content (nouns, adjectives, adverbs, and verbs) words presented either in sentence frames or in a list format. Task 4 gave further training on Task 2 and 3 words in the context of sentences having many overlapping word cues. Prior to and following Task 4 practice, each S received a two-trial recall test on Tasks 2 and 3 words.

Each S was trained under one of eight procedures in Task 1: Group I sight learned one-syllable words varying as the pairs used in Task 2; Group II did simultaneous and delayed matching-to-sample problems with nonsense letter strings that varied like the Group I materials; Group III learned paired-associates where the stimulus members were sets of

line-drawn objects paired to contrast like Group I materials and the response members were varied-colored designs; Group IV went through a series of matching problems with patterns of line-drawn objects arranged like the letter strings of Group II; Groups V and VI were trained like Groups III and IV respectively, but their training materials were not organized to promote improvement in discriminating letter cue differences; Group VII received the Group I training procedures on contrasting words that were single syllable concrete nouns familiar to kindergarten children; and Group VIII as it went through the Group VII training sequence, did matching problems with Group VII materials before and midway through the sequence.

Groups V and VI served as controls for nonspecific transfer effects. Groups VII and VIII were added later to the experiment to study some effects which were turning up in Groups I and II. It should be noted that the conditions in Task 1 represent variation on the following factors: (1) phonological and semantic features, (2) familiarity with training content, and (3) training task response requirements.

The Task 3 and 4 treatments were concerned with the role of contextual cues on learning and recalling function and content words. It was reasoned that since the distinctive semantic and phonological features of function words tend to be linked to syntax, context cues should increase the availability of function word responses and hence facilitate the acquisition and retention of these words. Support for this expectation would then favor teaching function words, which are most of the SWs, in sentence frames rather than as isolated words.

Eight kindergarten Ss, four of each sex, were assigned unsystematically to each of the eight treatment groups of Task 1. Each group was further split into eight treatment conditions for training in the remaining task: the eight treatments were combinations of word type (function vs. content) and list practice order (words to sentences vs. sentences to words) in Task 3 and the set of words (two comparable sets) used to construct the materials of Tasks 2-4. Since data analyses found Task 3 list practice order to be an insignificant effect, this factor was not considered in other data treatments.

Results and Discussion. Table 1 presents the summary data and ANOVA results by Task and Group. Differences due to the two word sets, though significant, are repressed in the table because this factor did not interact significantly with the comparisons discussed here. The table shows that the groups receiving only matching problems completed Task 1 in fewer sessions than did the other groups ($F = 9.89$, $df = 7/56$, $p < .01$). Attempts had been made in the pilot work to equalize training time on Task 1, but apparently the pilot data were misleading in this respect.

TABLE 1

Experiment I Means and ANOVA Results*

Group	Task 1 Treatment	Task 1 Sessions	Task 2 Sublists: Trials to criterion	Task 2 10-word List: Errors	Task 4 Pre-test: Errors	Task 4 Post-test: Errors	Task 4 Sentences: Errors 1st Sentence trial	Task 4 Sentences: Trials to criterion
I	Sight learn contrasting words	3.69	8.00	20.63	7.25	4.38	3.94	6.00
II	Matching letter strings	2.94	12.38	27.50	9.44	7.06	4.75	10.88
III	PA learn figure patterns	3.69	15.25	24.75	8.38	6.31	5.25	11.12
IV	Matching figure patterns	2.94	14.81	21.25	9.37	7.00	5.25	10.00
V	PA learn unsystematic figure patterns	3.56	13.38	21.62	8.25	6.69	5.56	7.38
VI	Matching unsystematic figure patterns	1.94	12.25	14.88	7.25	4.31	3.69	8.63
VII	Sight learn contrasting concrete nouns	3.37	15.50	30.88	11.19	9.63	7.69	12.88
VIII	Match and sight learn concrete nouns	3.81	8.13	22.12	8.19	5.06	4.94	9.87
	F	9.89	2.07	1.02	1.63	2.18	3.23	1.60
	df	7/56	7/48	7/48	7/32	7/32	7/32	7/32
	p	<.01	<.10	>.10	>.10	<.10	<.05	>.10

*Each mean is based on scores from 8 subjects.

Two measures of Task 2 performance are given in Table 1. The trial criterion was three consecutive errorless trials on a four-word and a six-word sublist of Task 2 words. Following criterion attainment on the six-word list, the ten words were practiced as a whole list for another ten trials. As the table indicates, only Groups I and VIII showed any noticeable gain in learning the sublists, which probably accounts for the marginally significant F value found for the overall group difference ($F = 2.07$, $df = 7/48$, $p < .10$). The errors on the ten-word list show a somewhat different pattern. Here, Group VI, a control for nonspecific transfer of the matching tasks, excelled all other groups, while Group VII was at the other extreme. In this case, however, the overall difference among groups failed to reach significance ($F = 1.02$, $df = 1/48$, $p > .10$).

Performance on Task 2 also fails to agree with expectations based on the results of other research. Muehl (1960, 1961) found discrimination pretraining given kindergarten children tc be facilitative when the words learned in the transfer task were involved in pretraining. He has also found facilitation from pretraining on different words, which led him to believe, after quizzing his Ss, that the children had learned to attend to single letters and word letter positions. Samuels and Jeffrey (1966) obtained data which showed learning words with many overlapping letters was more conducive to learning the same words with a new letter substituted at different letter positions than giving pretraining on words having many different letters. They concluded, like Muehl, that kindergarten children will learn to attend to letter differences and letter position when trained with the proper contrasting words. Samuels (1969) has reported in another study involving children that delayed matching of confusable letters produced better paired-associate learning with these letters as stimuli than pretraining using a no delay matching procedure. As can be seen, many of the pretraining features of these studies are found in the Task 1 treatments. However, in view of the unusual pattern of performance across the treatment groups on Task 2, it would be gratuitous at this time to attempt any accounting of the discrepancy in results between these studies and the present one.

Discussion of Task 3 data will be omitted here. Regarding the role of context on word learning, the findings of Task 4 generally show that function words did not derive any benefit from sentence practice relative to content words. This was most clearly demonstrated by the uniform difference in error rates on the recall test straddling Task 4 sentence learning (i.e., the pre- and posttest). As others have found, of course, significantly more errors were made on the function words.

But putting aside the issue of differential learning of function vs. content words in sentence frames, it should be noted from Table 1 that having children learn words in a sentence context may not be a very effective way to learn sight words. While Task 4 posttest errors

are fewer than the pretest ones, the gain from sentence practice seems relatively small when considering that the Task 4 sentence list was carried to a three consecutive errorless trial criterion and that the sentences in this list were designed to be difficult to discriminate.

Experiment II

Design and Procedure. The second experiment was designed to determine if making the SW and phonics-based or rule word (RW) contents more distinctive either through stimulus variation or the form of practice would facilitate transfer to the reading context. The treatment groups listed in Table 2 reflect variation on factors which should affect the recall and transfer of word materials. Specifically, these factors and the relevant treatment groups from Table 2 are:

(1) The form of transition from SW and RW practice to reading--Mixed list vs. Sentence practice conditions of Groups 1 through 4;

(2) the amount and order of practice on SWs relative to RW practice--orthogonal treatment of both factors in Groups 1, 3, 7, and 10;

(3) the distinctiveness of SWs--variation in SW cueing in Groups 5 through 10; and

(4) the interaction of SW cueing with the amount of separate SW and RW practice prior to reading practice--reduction in SW and RW list practice across Groups 9 through 14.

Interest in the mixed list vs. sentence practice comparison comes from raising question with the current model for sequencing reading instruction. Usually separate instruction is given on SW and RW materials just prior to practice on reading sentences containing these materials and words previously learned. This sequence involves considerable context change which could interfere with the transfer of previously learned responses to the reading context. A more appropriate transition from list practice to reading therefore might be intervening practice on a mixed list involving both types of words. Practice amount and list order were considered in Experiment II because these factors are known to influence retention and transfer. The SW cueing condition was motivated by findings that show cueing tends to aid recall. The SWs were made distinctive from the RW contents by associating a single marker or cue with SWs--this cue was a light blue patch appearing underneath the SW.

TABLE 2

Experiment II Training Sequences and Subjects Per Word Set

Group	Training Sequence	SW Cueing in Training[a]	Number of Subjects Set 1	Number of Subjects Set 2
1	SW_1[b] → RW → Mixed	None	4	4
2	SW_1 → RW → Sentences	None	4	4
3	SW_3 → RW → Mixed	None	4	4
4	SW_3 → RW → Sentences	None	4	4
5	RW → SW_1 → Mixed	SW, Mixed	4	4
6	RW → SW_1 → Mixed	Mixed	4	4
7	RW → SW_1 → Mixed	None	4	4
8	RW → SW_3 → Mixed	SW, Mixed	4	4
9	RW → SW_3 → Mixed	Mixed	4	4
10	RW → SW_3 → Mixed	None	4	4
11	RW → SWs in sentences	Sentence	4	4
12	RW → SWs in sentences	None	4	4
13a	SW_3(u)[c] → RW(u) → Mixed	SW, Mixed	2	2
13b	RW(u) → SW_3(u) → Mixed	SW, Mixed	2	2
14a	SW_3(u) → RW(u) → Mixed	None	2	2
14b	RW(u) → SW_3(u) → Mixed	None	2	2

[a]Groups receiving SW cueing during training also had the SWs cued in the retention-transfer task.

[b]Subscripts 1 and 3 denote the learning criterion on the SW list, i.e., one or three successive errorless trials. Other lists were learned to a one errorless trial criterion.

[c]The u in parentheses signifies that these groups were trained with words and phonics materials unrelated to the content covered in the subsequent mixed list and retention-transfer task.

Table 2 shows the list practice sequences used in the various treatment groups. The table indicates that an equal number of Ss in each treatment group received training and testing on each of two sets of comparable word materials. The kindergarten Ss were assigned to the treatment-word set combinations unsystematically with approximately an equal number of each sex trained under each combination. The a and b subgroups of treatment groups 13 and 14 may be disregarded since the list practice sequence of these subgroups did not influence subsequent practice and transfer.

Each S received training on a SW list, a RW list and either on a mixed list of the SWs and RWs or a set of sentences constructed from these words. The practice procedures on sentences and the mixed list were arranged to be as similar as possible. Twenty-four hours after criterion attainment on the last list of the practice series, all Ss were given a retention-transfer task. This task consisted of learning sentences made up of previously learned SWs, RWs, and new RWs containing the spelling-sound correspondents of the old RWs. Prior to sentence practice, each S received a three-trial, no-feedback test on the sentences.

The paired-associate anticipation method was used for training on word and sentence items. Each RW was practiced by having the S sound it out by individual phonemes and then give its blended or whole word pronunciation. For sentence practice, the S was required to respond to each sentence word as it was presented individually and in sentence order and then to the sentence as a whole unit.

Results and Discussion. The major results of Experiment II are given in Table 3. The data for the word sets, the factor orthogonal to all treatments listed in Table 2, will not be considered here. The mixed and sentence list results given in Table 3 are based on a ten trial practice series which followed criterion achievement on subparts of each list, i.e., the pairs and sublists of the mixed and individual sentences of the sentence condition.

The data were analyzed in terms of groups representing the levels on factors that were specifically addressed in Experiment II. Groups 1 through 4 took part in the first comparison, which was concerned with form of transition from SW and RW practice to reading. The mixed list groups were expected to excel the sentence list groups on the retention-transfer task because the former condition allows the reader to operate concurrently with the SW and phonics word attack, as he would be doing in reading, but under conditions where appropriate discrimination between contrasting words can be formed without interference from sentence meaning and syntax.

Table 3 shows this expectation to be mildly supported in the retention-transfer task data for the groups receiving the most practice on

TABLE 3

Experiment II Means

Group	Mixed-Sentence List: Word Type Errors			No Feedback Retention-Transfer: Word Type Errors			Retention-Transfer Training: Trials to Criterion
	List	SW	RW	SW	RW	New RW	
1	Mixed	8.87	14.38	4.84	6.50	14.25	4.12
2	Sentence	7.00	6.25	4.97	5.13	14.52	3.25
3	Mixed	9.75	14.00	2.13	4.25	14.99	2.88
4	Sentence	4.37	4.88	5.75	6.38	14.31	3.12
5	Mixed (c)*	5.25	10.00	1.38	4.12	14.40	2.38
6	Mixed (c)	6.75	10.75	3.69	5.13	13.98	4.62
7	Mixed	3.63	8.25	.46	1.50	13.90	4.87
8	Mixed (c)	5.75	10.75	1.63	4.75	14.06	4.12
9	Mixed (c)	4.25	7.75	1.19	4.00	15.00	3.00
10	Mixed	4.25	7.75	2.62	3.13	14.24	4.87
11	Sentence (c)	5.13	8.88	4.46	5.38	14.56	3.50
12	Sentence	4.38	5.38	5.75	5.00	14.30	4.25
13	Mixed (c)	13.25	21.87	4.19	5.00	14.56	5.00
14	Mixed	11.50	14.50	3.31	4.38	13.67	3.25

*Cued sight words

the SW list (Groups 3 and 4), although SW practice amount was not found to interact significantly with RW practice context. In terms of errors made during practice on the mixed and sentence lists, it can be seen that fewer errors were made in the sentence context ($F = 4.58$, $df = 1/24$, $p < .05$) and that this error rate varied over word type ($F = 9.57$, $df = 1/24$, $p < .01$). But in view of the retention-transfer task results, it is apparent that the superiority of the sentence condition was limited to the list practice condition. The conclusion from Experiment I that word learning in a sentence or reading context is largely ineffective would therefore still stand.

The amount of SW list practice and its sequencing with RW practice were evaluated with Groups 1, 3, 7, and 10. The findings of studies in verbal learning would lead one to expect that competition from RW materials would vary inversely with the amount of SW list practice and that less interference would result from practicing SWs before RWs than from the reverse order of practice.

The values given in Table 3 do not support either expectation. Rather the RW to SW sequence of Groups 7 and 10 led to significantly fewer errors ($F = 4.50$, $df = 1/84$, $p < .05$) on the no-feedback test. This effect however varied with the amount of SW practice. It appeared that list practice order became less important as SW practice increased, although the interaction was only marginally significant ($F = 3.86$, $df = 1/84$, $p < .10$). The tenuousness of list practice order effects was also indicated in the tendency of the SW to RW sequence groups to reach criterion on the retention-transfer task in fewer trials than the RW to SW groups, but this too was only a marginally significant effect ($F = 3.30$, $df = 1/84$, $p < .10$).

Groups 5 through 10 were used to determine whether SW cueing would facilitate learning and retention of word materials. Cueing should be effective since clearly labeling words to be learned and recalled as whole units should reduce competition from phonics decoding responses. During the course of the study it became apparent that cueing was having the opposite effect, namely, a source of interference. A search of the literature revealed that other investigators (Peterson & Peterson, 1957; Berry & Baumeister, 1970) had encountered the same problem. Two treatment groups, Groups 6 and 9, were therefore added to the study in an attempt to reduce this interference. These groups received the cueing condition after SW list practice. It was reasoned that the interfering associations involving the cueing stimulus might be considerably weaker than the associations made with the printed word if the primary associations were established first.

As Table 3 reveals, whether cueing is used when the primary associations are being formed or introduced later makes little difference. The differences between the cued conditions and the control or noncued condition were found to be statistically unrealiable in all comparisons made.

The last comparison was concerned with how SW cueing might interact with the amount of separate SW and RW practice given prior to reading practice. If cueing were found to reduce interference between SW and RW contents, then list practice might be shortened if not eliminated. However since SW cueing effects were negative, this comparison is not considered further.

The conclusions to be drawn from these experiments, while less than one might hope for from the large body of psychological research from which the conjectures were derived, have important implications for the design of reading instruction. The data are relatively clear on context learning and SW cueing effects. Learning words in context or accompanied by an extrinsic marker which identifies the word type does not facilitate word identification. Some of the Task 1 conditions of Experiment I appeared to facilitate learning words and sentences having many overlapping cues. However, additional research will be required before the factors associated with the diverse treatments (Groups I and VIII, and Group VI a control condition) which demonstrated facilitation can be clearly identified. List practice order in Experiment II also produced some promising results. But whether this effect is limited to rather specific list practice levels cannot be answered definitively with the present data. The requirement to reduce the uncertainty still surrounding the sequencing SW and RW materials for beginning reading instruction is obvious, and therefore research focusing on such factors as practice amount and order, and list content will be pursued further at the Southwest Regional Laboratory.

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